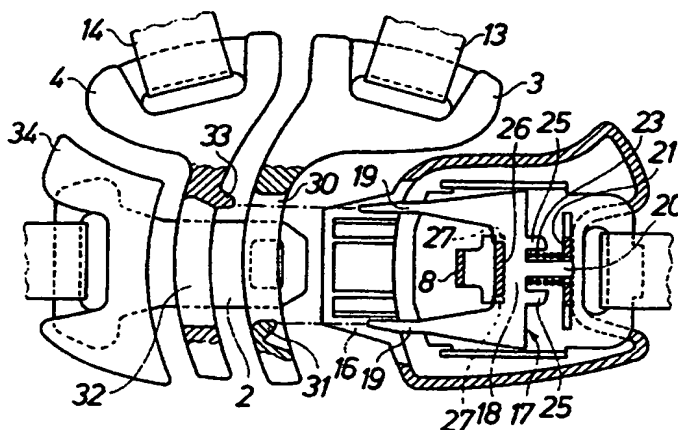




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(21) International Application Number: PCT/SE94/00351 (22) International Filing Date: 20 April 1994 (20.04.94) (30) Priority Data: 9301299-5 20 April 1993 (20.04.93) SE (71) Applicant (for all designated States except US): BRÖDERNA HOLMBERGS FABRIKS AB [SE/SE]; P.O. Box 63, S-334 21 Anderstorp (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): ANDERSSON, Bengt [SE/SE]; Växjövägen 64, S-331 42 Värnamo (SE). (74) Agent: STRÖM & GULLIKSSON AB; P.O. Box 4188, S-203 13 Malmö (SE).		(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, LV, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>

(54) Title: LOCK FOR SAFETY BELTS HAVING TWO HIP STRAP PARTS AND AT LEAST TWO ADDITIONAL STRAP PARTS

**(57) Abstract**

The invention relates to a lock for safety belts having two hip strap parts and at least two additional strap parts. The lock comprises a lock housing for attachment to one of the hip strap parts, said lock housing comprising a lock mechanism having a manually actuatable release member, a lock tongue (2) for attachment to the other hip strap part, said lock tongue being insertable into an insertion opening in the lock housing for cooperation with the lock mechanism, and at least two fittings (3, 4) adapted for being coupled together with the lock housing and lock tongue by moving them into locking engagement with each other. Movably disposed in the lock mechanism is an ejection means (17) which is spring biased towards the insertion opening, said ejection means having two ejection branches (19) protruding into the insertion opening, said ejection means, when positioned in its front position, blocking a locking hook (8) included in said lock mechanism in inactive position, and in its rear position releasing said locking hook for movement into locking position.

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**TITLE OF INVENTION: LOCK FOR SAFETY BELTS HAVING TWO
HIP STRAP PARTS AND AT LEAST TWO
ADDITIONAL STRAP PARTS**

5 The present invention relates to a lock for a safety belt having two hip strap parts and at least two further strap parts.

 Safety belts of this kind are preferably used as vehicle safety belts for children. In addition to the hip
10 strap parts, which are attached on opposite sides of the seat, the safety belt includes two shoulder straps which are attached behind the seat and possibly also a crotch strap which is attached below in front of the seat.

 According to a safety belt available at the market
15 and intended as safety belt for children, the lock comprises a lock housing which is attached to one hip strap part and a lock tongue for cooperation with the lock housing, said lock tongue being attached to the other hip strap part. Both shoulder strap parts are provided with
20 fittings to be thread on to the lock tongue and held in place on the tongue in abutment against the lock housing when the lock tongue together with the fittings thread thereupon have been brought into locking engagement with the lock mechanism on the lock housing. The lock mechanism
25 of this prior art lock comprises an ejection member which is movable within the lock housing and is spring biased towards the entrance opening for the lock tongue in the lock housing. The ejection member comprises a disc shaped body having a transversally extending part and two ejection
30 branches protruding in parallel from the ends of the transversally extending part in the direction towards the entrance opening, said ejection branches protruding into the entrance opening when the lock is open. When the ejection member is positioned in its front position, it also serves
35 as a stop means, preventing the locking latch to move into locking position. A release of the locking latch thus re-

quires that both ejection branches are simultaneously pushed into the lock housing to such an extent that the ejection member is displaced out of locking position, so that the locking latch is left free to perform a locking movement when the lock tongue has been inserted into locking position in the lock. In order to secure with the previously known lock for safety belts described above, that both ejection branches are pushed inwardly simultaneously, the fitting which in locking position is intended to abut the lock housing, is provided in two fixed protrusions extending towards the entrance opening and arranged so as to displace the ejection member inwardly into the lock when the lock tongue together with fittings thread on the lock tongue, is pushing the ejection member inwardly into the lock to release the blocking of the locking latch so that locking is obtained.

One inconvenience inherent in the known lock for safety belts described above is that its design renders possible to obtain locking after introduction of a lock tongue into the lock housing also when only the fitting which is provided with said protrusions is thread upon the lock tongue. In order to obtain this it is necessary that the fitting is held in abutment against the lock housing when the lock tongue is introduced therein. When using the known lock for safety belts described above one cannot exclude that incomplete fastening of a child in the safety belt is obtained due to the fact that locking action can be obtained in spite of the fact that only one shoulder strap part has been attached. This is unsatisfactory and could result in that the child, if a collision occurs, is thrown out of the safety belt at the side thereof at which the shoulder strap part has not been attached.

In another previously known safety belt this inconvenience has been eliminated by providing the fitting, which is intended to directly abut the lock housing, with

only one firm projecting protrusion positioned just in front of one of the ejection branches, whereas just in front of the other ejection branch said fitting is provided with a through opening for a pin which is displaceable therein. Just in front of said pin, the other fitting is provided with a firm projecting protrusion, which, when said fittings are brought into close contact with each other, is caused to displace the movable pin into a position in which it protrudes to such an extent that said pin will act upon the corresponding ejection branch when the fittings, in a state in which they are held together, is pressed against the lock housing. In order to obtain locking of the safety belt, it is thus necessary that the fittings from both shoulder strap parts are coupled.

In use of the safety belt of the design mentioned above, it has occurred, however, that the movable pin has fallen away, has been broken or has been become seized up in the opening of said fitting, which either has made lock impossible to use or has prevented the intended safety function.

The lock in accordance with the present invention comprises, in a manner known per se, a lock housing for attachment on one hip strap part, said lock housing enclosing a lock mechanism to be actuated manually, a lock tongue to be fastened on the other hip strap, said lock tongue being insertable into a entrance opening of the lock housing for cooperation with the lock mechanism, and at least two fittings to be coupled together with lock housing and lock tongue when those are brought into locking engagement with each other.

The object of the present invention is to provide a safety belt, having a simple and reliable design, in which the disadvantages with the safety belts of the kind mentioned above have been eliminated, and which thus prevents locking of the safety belt if all strap parts have

not been attached correctly, and which also provides an extra security preventing release of the lock when only one ejection branch is pressed into the lock housing.

5 According to this invention, the objects mentioned above are obtained by means of a design of the lock in accordance with the appended claims.

The invention is described below in connection with an example of an embodiment with reference to the appended drawings, on which

10 - fig 1 is a longitudinal section through a lock for a safety belt in accordance with the invention, shown in locked position,

- fig 2 is a partial, sectional plan view of the lock shown in fig 1,

15 - fig 3 is a partial, sectional plan view of the lock according to fig 2, with lock housing, lock tongue and shoulder straps thread thereupon, separated from each other,

20 - fig 4 illustrates a lock for safety belts according to the invention, which renders possible simultaneous locking of five strap parts,

- fig 5 illustrates a variant of the lock for safety belts according to fig 4,

25 - fig 6 is a schematical, partly sectional plan view of the lock mechanism, showing the position of the ejection means of the lock mechanism, with the lock in locked position,

30 - fig 7 corresponds to fig 4 but shows the position of the lock member of the lock mechanism with the lock in unlocked position,

- fig 8 shows the position of the lock member of the lock mechanism when only one ejection branch is made subject to an axial force for introduction of the ejection member into the lock mechanism,

- fig 9 shows the stop pins of the ejection means in accordance with one embodiment according to the invention.

The lock according to the invention and shown on figs 1-3 is intended for a safety belt with hip straps and two shoulder straps of the kind used as car safety belts for children. The lock comprises a lock housing 1 and a lock tongue 2 and two shoulder strap fittings 3 and 4. The lock housing 1 comprises a lock mechanism 5, including a metallic frame comprising two parallel metal plates 6, 7 between which the lock tongue 2 shall be introduced. The lock mechanism further comprises a locking latch 8, which is swingably mounted, which by means of a spring arrangement, not shown, can be caused to swing between two extreme positions: one locking position in which the locking latch 8 engages into an opening 9 of the lock tongue 2, and an idle extreme position. By means of said spring arrangement, not shown, the locking latch may be caused to perform a snap-in movement between said extreme positions. Disposed in the casing of the lock housing 1 is a release button 15 which is displaceable against spring bias between a front and a rear position, said release button being arranged so that when being displaced to its rear position, it causes the locking latch 8 to snap from locking position into idle position. The metal frame extends out of the lock housing 1 at one side thereof, forming a lug 10 for one of the hip strap parts 11. At the opposite side the lock housing is formed with a protruding nose portion 16, delimiting the entrance opening through which the lock tongue 2 shall be introduced into the lock and be locked in the lock mechanism 5. The other hip strap part 12 shall be attached to the lock tongue 2, and both fittings 3 and 4 shall be attached, each one to the corresponding part of said two shoulder strap parts of the safety belt.

The lock mechanism comprises, in a manner known per se, an ejection means 17. The ejection means comprises a

plane, substantially U-shaped disc, which is displaceably disposed in the space between plates 6 and 7 of the lock mechanism. The ejection means comprises a transversely extending basic portion 18 with two ejection branches 19 protruding from the respective end parts of the basic portion, said ejection branches having their ends extending into the nose portion 16 of the lock housing 1 in the vicinity of the entrance opening formed by the nose portion 16. On the side facing away from the ejection branches 19, the basic portion 18 of the ejections means is provided with a centrally protruding pin 20, extending through an opening 22 in the rear wall 21 of the locking hook 8. A spring 23 is thread upon the pin 20, said spring urging the ejection means towards a front stop position in abutment against an intermediate wall 24 of said locking hook 8. The basic portion 18 of the ejections means is on opposite sides of the pin 20 provided with two symmetrically with respect to the pin 20 protruding stop abutments in the form of two protruding abutment pins 25, protruding a shorter distance than the pin 20, said abutment pins 25 by abutting the rear wall 21 of the locking hook delimiting the displacement of the ejection means into the lock mechanism. A recess 26 is formed in the side of the basic portion 18 facing the entrance opening, said recess having a width corresponding to the width of the intermediate wall 24 of the locking hook just in front of the recess 26. Underneath said recess the intermediate wall of the locking hook extends outwardly on opposite sides of the recess and forms two stop abutments 27 for cooperation with the edge portions of the base portion 18 of the ejection means which laterally delimit said recess therein. When the ejection means is in its front stop position, said edge portions are positioned above the stop abutments 27 of the locking hook 8, thereby preventing the locking hook from snapping into locking position. For releasing the locking hook the ejection

tion means 17 thus must be displaced rearwardly, into the locking mechanism to such an extent, that said edge portions of the recess 26 of the basic portion 18 of the ejection means 17 are brought out of locking engagement with the stop abutments 27 of the locking hook. In order to impart this displacement to the ejection means 17 it is necessary to simultaneously apply pushing-in forces towards the ends of both ejection branches 19 extending into the entrance opening.

When the safety belt shall be locked, both shoulder strapfittings 3 and 4, thread upon the lock tongue 2, shall be moved into abutment against the lock housing 1. The shoulder strap fitting 3 which shall be in direct abutment against the lock housing 1 is formed with an abutment surface facing the lock housing, being shaped complementary to the corresponding surface of the lock housing 1, so that the fitting and the lock housing fit with each other in a puzzle-like manner. The shoulder strap fitting 3 is provided with a through opening 30 designed so as to provide guiding cooperation with the nose portion 16 of the lock housing 1 when the fitting is thread thereupon. At the bottom edge of said through opening 30 is provided a protrusion 31 extending into the opening 30 and formed as a rigid part of the fitting, the free end of said protrusion which is facing the lock housing 1 being positioned just opposite the corresponding ejection branch extending into the entrance opening and in contact therewith when the fitting has been brought into abutment against the lock housing 1. The other shoulder strap fitting 4 is designed so that its surface abutting said first shoulder strap fitting 3 has a complementary form with the corresponding surface of the fitting 3. The second shoulder strap fitting 4 is also formed with a through opening 32, being dimensioned to provide guiding cooperation with the nose portion 16 of the lock housing when both fittings 3, 4 are moved

into engagement with the lock housing. The upper edge of the through opening 32 is provided with a protrusion formed as a rigid part of the fitting extending into the opening 32 and in a direction towards the first fitting 3, so that it extends a small distance into the opening 30 of said fitting when the fittings are in abutment with each other. The protrusion 33 is so shaped, that the free end thereof facing the lock housing is positioned just opposite the corresponding ejection branch 19 extending into the entrance opening, and in contact therewith when both fittings 3, 4 have been brought into engagement with the lock housing 1. The lock tongue 2 which is to be moved through the openings 32 and 30 of the shoulder strap fittings 4, 3 and together with them into engagement with the lock housing 1, is at the end to be connected to the hip strap part formed with a gripping body 34, the surface thereof abutting the fitting 4 having a complementary form with the corresponding surface of said fitting. Lock housing 1, shoulder strap fittings 3, 4 and the gripping body of the lock tongue 2, thus have a form engagement with each other in a puzzle-like manner, thereby preventing that the parts are coupled together in an incorrect order.

As appears from the description, the safety belt lock described with reference to the figs 1-3 is intended for simultaneous locking of four strap parts, i.e. two hip strap parts and two shoulder strap parts. Fig 4 illustrates in a corresponding manner as in fig 3 an embodiment according to the invention of a safety belt lock, which renders possible simultaneous locking of five strap parts, i.e. two hip strap parts, two shoulder strap parts and a third part, in the following called crotch strap part and being intended to be attached in the floor of the vehicle in front of the seat. The safety belt lock according to fig 4 comprises, like the lock previously described, a lock housing 1 encapsulating a lock mechanism having a locking

hook 8 and an ejection means 17. The lock further comprises a lock tongue 2 and two shoulder strap parts 3 and 4. Lock housing 1, lock mechanism 5 and lock tongue 2 and safety belt fittings 3 and 4 correspond where applicable with the description of corresponding description parts in connection with figs 1-3. The embodiment according to fig 4 differs from the embodiment previously described in that it should be possible to attach and firmly locking a fifth strap part in the lock simultaneously with the remaining strap parts. For this purpose the crotch strap is provided with a crotch strap fitting 28 to which the crotch strap is attached and which is designed so that it can be introduced into a recess 29 at the lower part of the shoulder strap fitting 3. The crotch strap fitting is further at the upper portion thereof formed with an outwardly extending protrusion 38, corresponding to the protrusion 31 in the embodiment according to figs 1-3. The shoulder strap fitting 3 is thus completely in lack of protrusions. In use of the safety belt lock, the crotch strap fitting 28 is initially positioned into the recess 29 of the shoulder strap fitting 3, whereupon the shoulder strap fittings 3 and 4 are thread upon the lock tongue 2, which together with said fittings is brought into engagement with the lock housing 1 in a corresponding manner as previously described. The five point safety belt lock illustrated in fig 4 may also be caused to lock only provided that all strap part fittings have been correctly attached.

Fig 5 illustrates a variant of an embodiment of a five point lock according to the invention. In this embodiment the shoulder strap fitting 3 is identical with the corresponding shoulder strap fitting according to figs 1-3. The shoulder strap fitting 4, however, in this embodiment has been joined with the gripping body 36 of the lock tongue 2, so that one shoulder strap part as well as one of the hip strap parts is connected with fitting 36. According

to this embodiment, however, a crotch strap part 35 is being thread upon the lock tongue 2, said crotch strap fitting being provided with a protrusion 37 at the upper part thereof corresponding to the protrusion 33 of the embodiment according to figs 1-3. When the fitting 36 together with the crotch strap and shoulder strap fittings 35, 3 thread on the lock tongue 2 are moved into engagement with the lock housing 1, the locking will occur in a corresponding way as described in connection with figs 1-3. Also inn the embodiment according to fig 5, all strap fittings must be correctly mounted in order to obtain locking.

Figures 6-8 schematically illustrate some different functional positions of the ejection means in the lock mechanism.

Fig 6 shows the position of displacement into the lock mechanism achieved by the ejection means under the influence of inserting forces which simultaneously act upon both ends of the ejection branches 19 which protrude into the insertion opening, and in which position the blocking of the locking hook ceases due to the fact that the edge portions of the recess 26 have been displaced out of blocking engagement with the stop abutment 27 on the locking hook. The pin 20 on the base portion 18 of the ejection means is then displaced out through the opening 22 in the rear wall of the locking hook, simultaneously compressing spring 23. The displacement of the ejection means 17 into the lock mechanism is stopped when its abutment pins 25 come into abutment with the rear wall 21 of the locking hook. Since the blocking of the locking hook thus has ceased, the locking hook can snap into a locking position under the influence of the spring arrangement, not shown.

Fig 7 shows the ejections means 17 in its former blocking position in the lock mechanism. This blocking position is obtained when the release button 15, which is

displaceable in the lock housing, has been moved into its rear position and then has caused the locking hook 8 to snap out of locking position, whereby the ejection means 17, under the influence of the spring force from the spring 23, is being displaced into the blocking position, simultaneously pushing out the shoulder strap fittings 3,4, also including the lock tongue 2 in this movement.

The movement of the ejection means 17 between the positions shown in figs 4 and 5 is thus obtained through parallel displacement of the ejection means in the lock mechanism. This parallel displacement movement, however, is not guide controlled in the lock mechanism, but the ejection means 17 is shaped so that a certain inclined position thereof within the lock mechanism is allowed.

Fig 8 illustrates such an inclined position of the ejection means, caused by the fact that only one of the ejection branches 19 is being pressed inwardly towards the lock mechanism, for instance due to the fact that only one shoulder strap part 3 has been thread upon the lock tongue 2 and is pressed against the lock housing 1. The ejection means 17 is then subject to an extricically attacking force causing the ejection means to perform a swinging movement sideways, as illustrated in fig 8. It is true the ejection means hereby is being moved inwardly into the lock mechanism, so that the blocking at one side of the locking hook ceases, but as a result of the swinging movement in the sideways direction of ejection means, the blocking will still remain at the opposite side of the locking hook. Due to this it is prevented to obtain locking at an attempt to use the safety belt lock when only one shoulder strap part is coupled. In order to allow swinging movement of the ejection means 17, the opening 22 in the rear wall of the locking hook is dimensioned so that it allows sufficient movement sideways of the pin 20 upon sideways swinging movements of the ejection means 17. The insertion opening

in the locking house should further have sufficient width in order to allow a certain movement sideways of the ejection branch 19 when the ejection means is subject to excentric actuation.

5 Fig 9 illustrates a preferred design of both abutment pins 25 of the ejection means. The abutment pins 25 are, as appears from the figure, obliquely cut, so that the end portion forms a point closest to the opening 22 through which the pin 21 protrudes. If an introduction force is applied on only one of the ejection branches 19, thereby causing the ejection means to move into the lock mechanism under certain sideways swinging movement, until the abutment pin 25, by means of its point abuts the rear wall 21 of the locking hook, the insertion force imparts a moment to the abutting pin 25, which acts in the same direction as the sideways swinging moments imparted to the ejection means 17 from the action of the introduction force on one of the ejection branches 19. Both of those moments thus cooperate in keeping the ejection means in blocking position over one of the stop abutments 27 of the locking hook when only one ejection branch is being displaced into the lock mechanism. By this an extra security against locking in the case of uncomplete coupling of the fittings of the strap parts is thus obtained. If the abutment pins instead had been obliquely cut so that the resulting point had been directed from the opening for the pin 20, i.e. sideways in a direction from the central line of the lock, the moments exerted by the insertion force on the abutting pin 25 would be able to counteract the moment which otherwise acts upon the ejection means, with the risk that the ejection means 17 could swing out of blocking position with the risk that the ejection means 17 could swing out of the blocking position and rendering possible unintentional locking of the lock in an incompletely coupled condition. There is a

risk of this unwanted effect also if the abutment pins 25 are cut in a right angle.

CLAIMS

5 1. Lock for safety belts having two hip strap parts
and at least two additional strap parts, said lock com-
prising a lock housing (1) to be attached on one of the hip
strap parts, said lock housing comprising a lock mechanism
10 (5) with a manually actuatable release member (15), a lock
tongue (2) to be fastened on the other hip strap part, said
lock tongue being insertable into an insertion opening in
the lock housing (1) for cooperation with the lock
mechanism (5), and at least two additional fittings (3, 4)
15 to be coupled together with lock housing (1) and lock
tongue (2) by moving them into a locking engagement with
each other, the locking mechanism comprising an ejection
means (17) with its spring biased towards the insertion
opening, said ejection means having two ejection branches
20 (19) protruding into the insertion opening, said ejection
means being arranged so as to block a locking hook (8) in-
cluded in the lock mechanism in inoperative position of
said hook when said ejection means is in its former posi-
tion, and to release the locking hook for movement into
locking position when the ejection means is in its rear
25 position, c h a r a c t e r i z e d in that the lock
housing (1) is formed with a protruding nose portion (16)
delimiting said insertion opening with said ejection
branches (19) extending into said insertion opening, at
least said two additional fittings (3, 4) having a through
30 opening dimensioned for guiding cooperation with said nose
portion (16) when said additional fittings are thread
thereupon, and that two of said additional fittings each
one has only one protrusion (31, 33) which is rigidly
attached to said fitting, said protrusion, when the
35 fittings (3, 4) are in abutment against each other and

against the lock housing (1), being caused to abut against the end of the respective ejection branch (19) extending into said insertion opening.

2. Lock as claimed in claim 1,

5 c h a r a c t e r i z e d in that each one of said protrusions of said additional fittings is formed as an integral part of the respective fitting, said protrusions extending outwardly in a direction towards the respective ejection branch (19).

10 3. Lock as calimed in claim 1 or claim 2,

 c h a r a c t e r i z e d in that the ejection means (17) on the side thereof facing away from the insertion opening in the lock housing (1), comprises two abutment pins (25), symetrically arranged, for delimiting the inser-
15 tion length of the ejection means (17) into the lock mechanism through abutment against a wall situated behind.

4. Lock as claimed in claim 3,

 c h a r a c t e r i z e d in that the free end of each abutment pin (25) is obliquely cut so that the end portion
20 thereof forms a tip tapering in the direction towards the center line of the lock.

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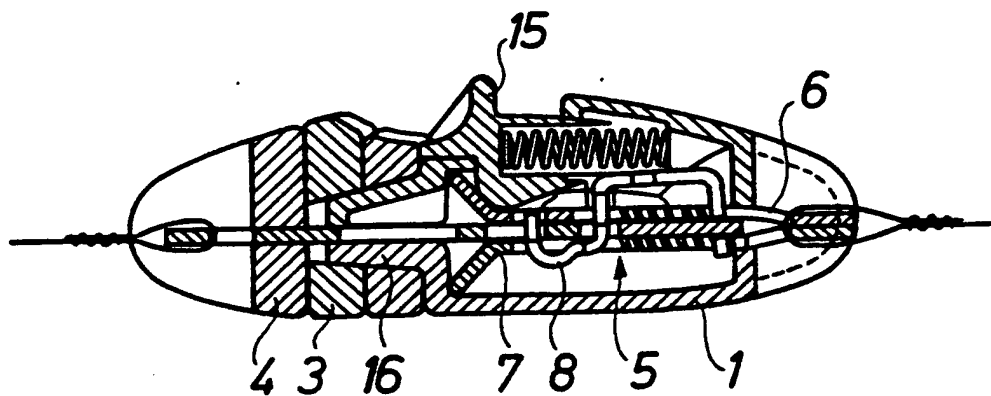


FIG. 1

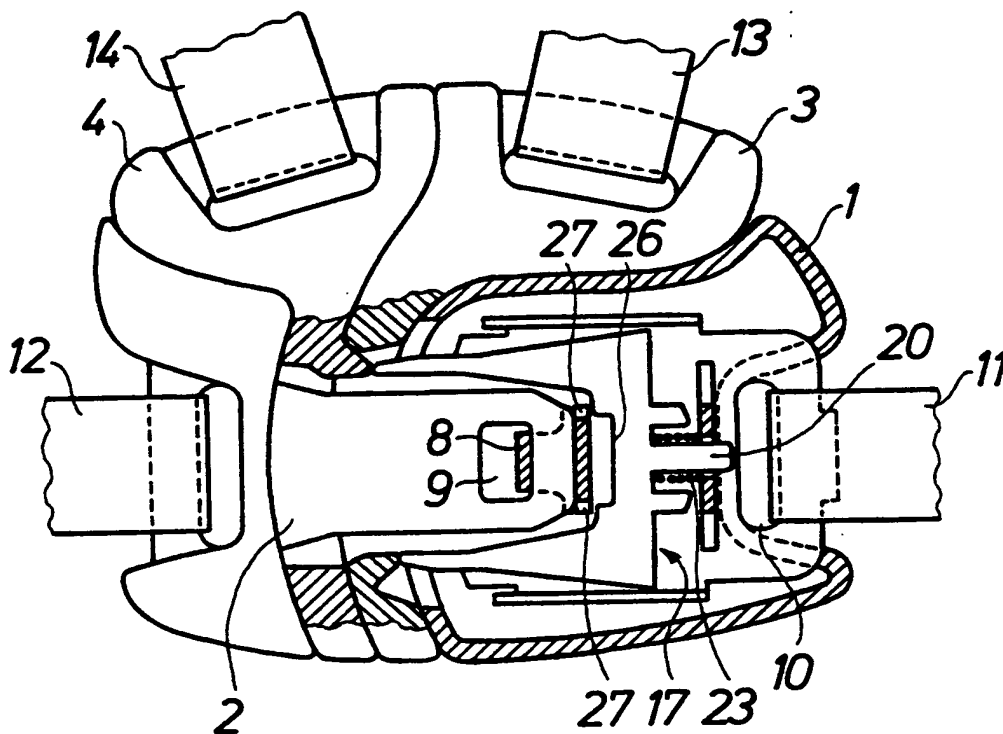


FIG. 2

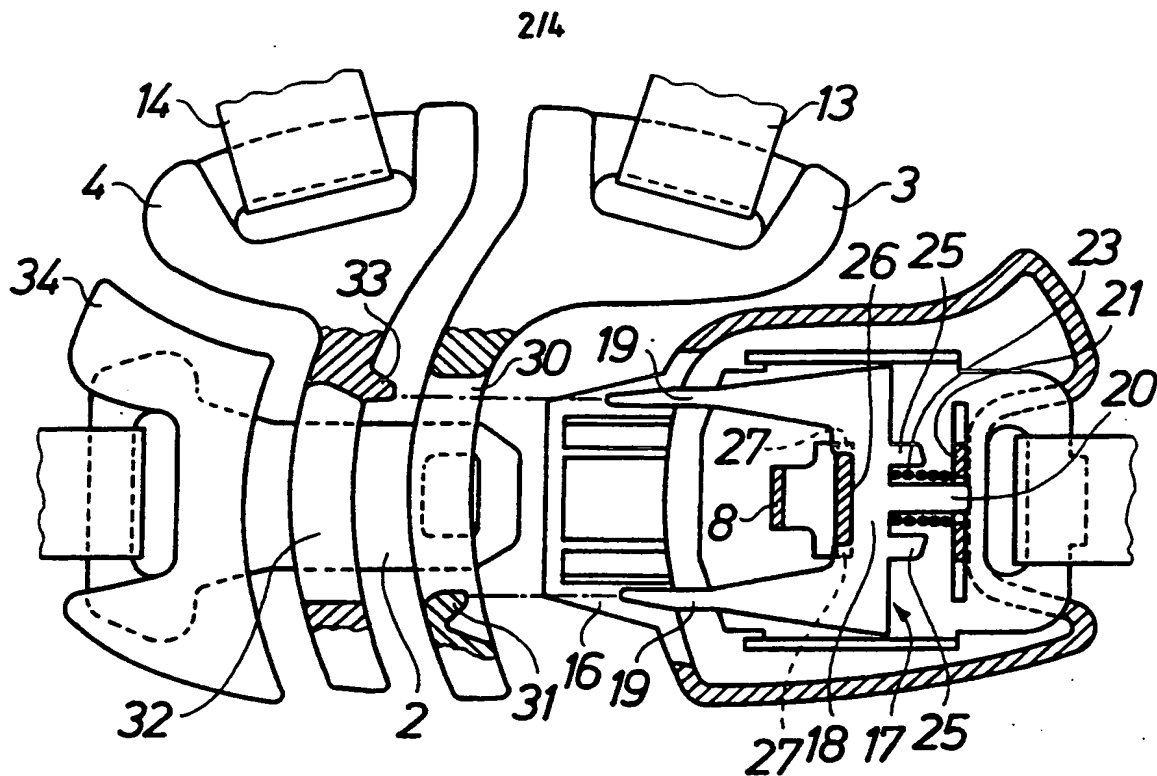


FIG. 3

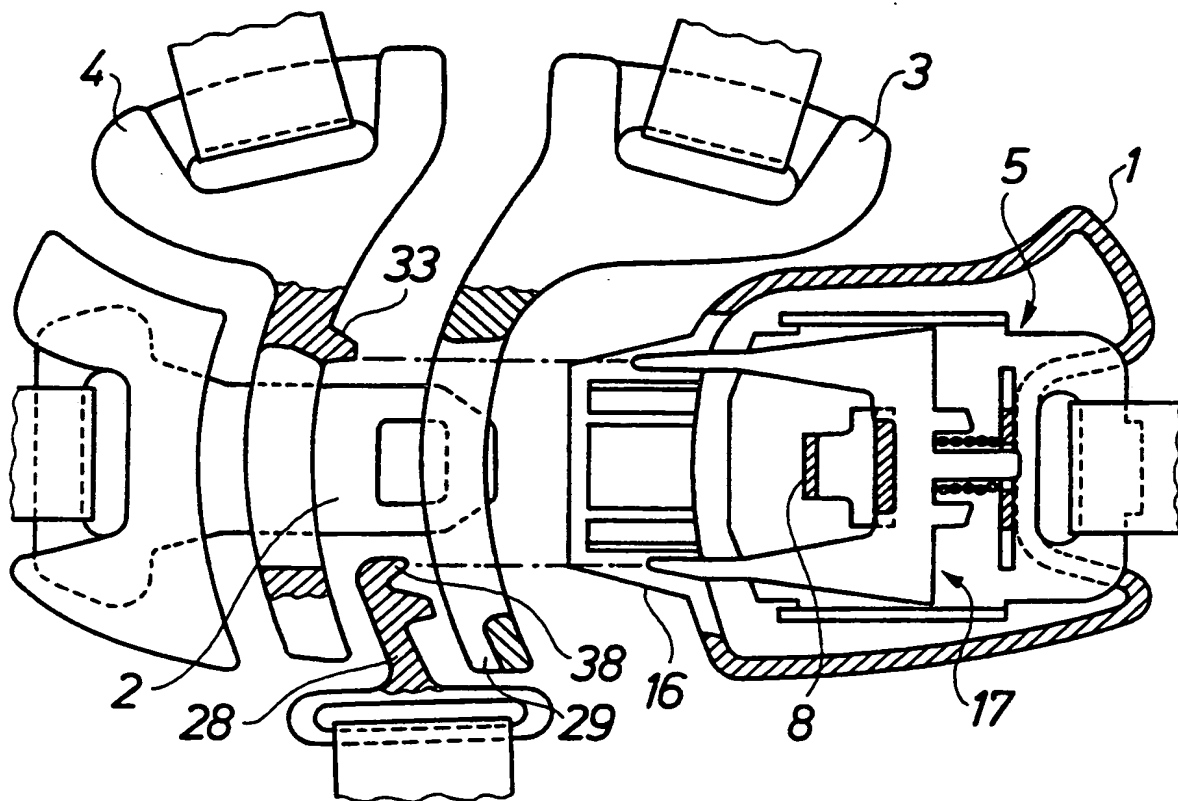
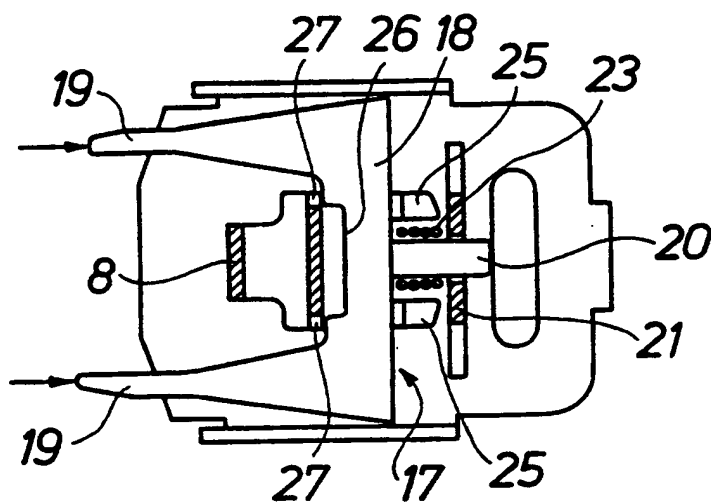
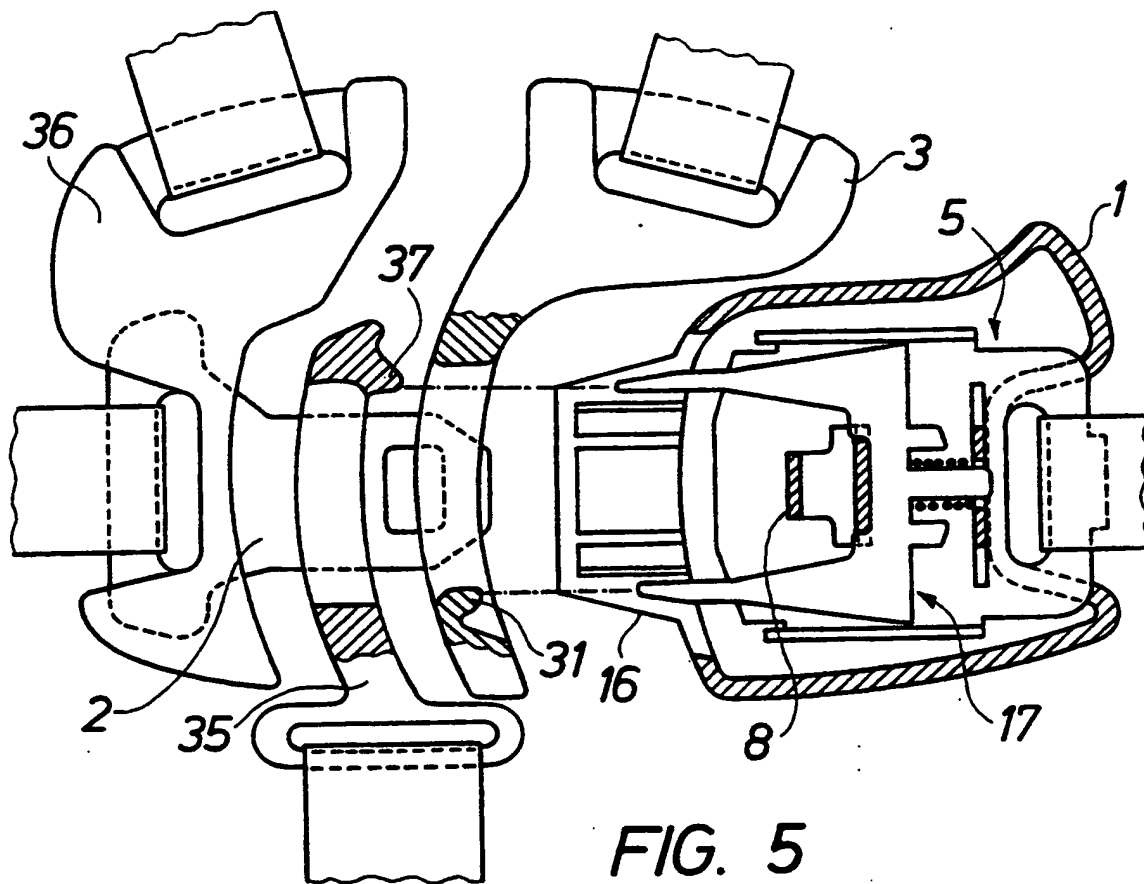
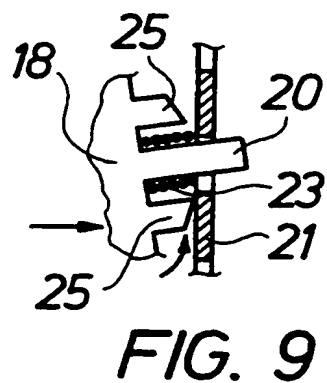
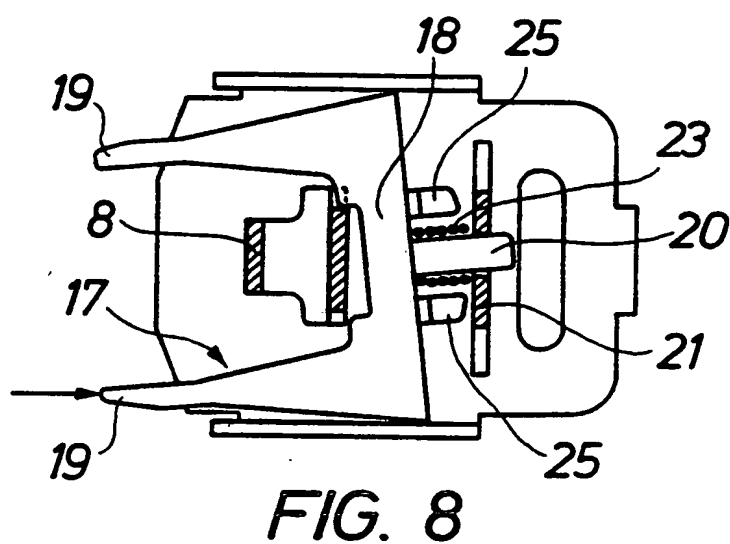
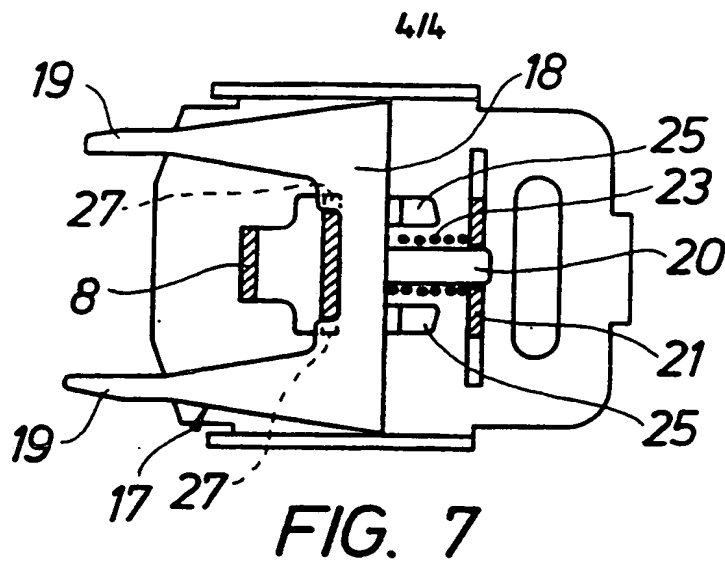


FIG. 4

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 94/00351

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: A44B 11/25

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: A44B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A1, 0225719 (BRITAX-EXCELSIOR LIMITED), 16 June 1987 (16.06.87)	1-4
A	SE, B, 441642 (BRÖDERNA HOLMBERGS FABRIKS AB), 28 October 1985 (28.10.85)	1-4
A	EP, A1, 0252403 (WILCKEN, HUGO, DR. ET AL), 13 January 1988 (13.01.88)	1-4

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

1 July 1994

Name and mailing address of the ISA/
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Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT
Information on patent family members

28/05/94

International application No.

PCT/SE 94/00351

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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